FIG.1

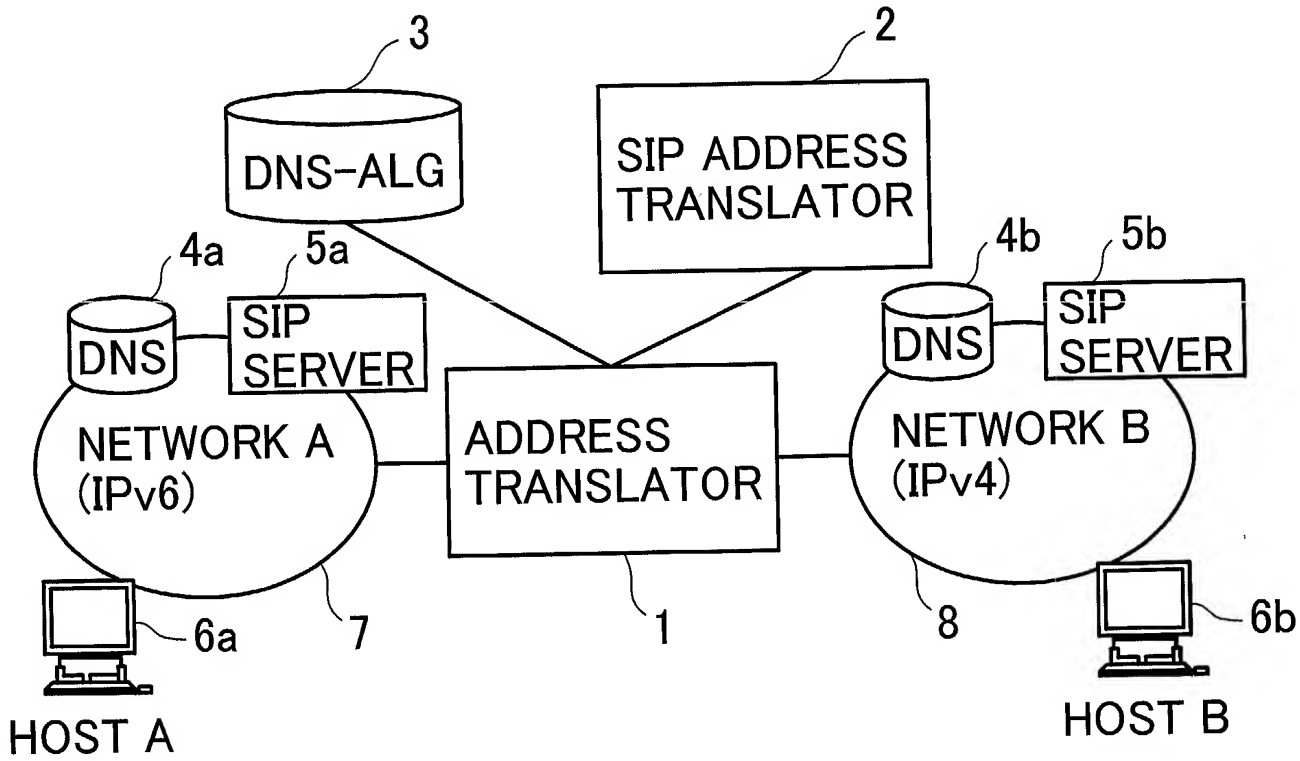

3
2
DNS-ALG
SIP ADDRESS TRANSLATOR
4a
5a
4b
5b
DNS
SIP SERVER
DNS
SIP SERVER
NETWORK A (IPv6)
ADDRESS TRANSLATOR
NETWORK B (IPv4)
6a
7
1
8
6b
HOST A
HOST B

FIG.2

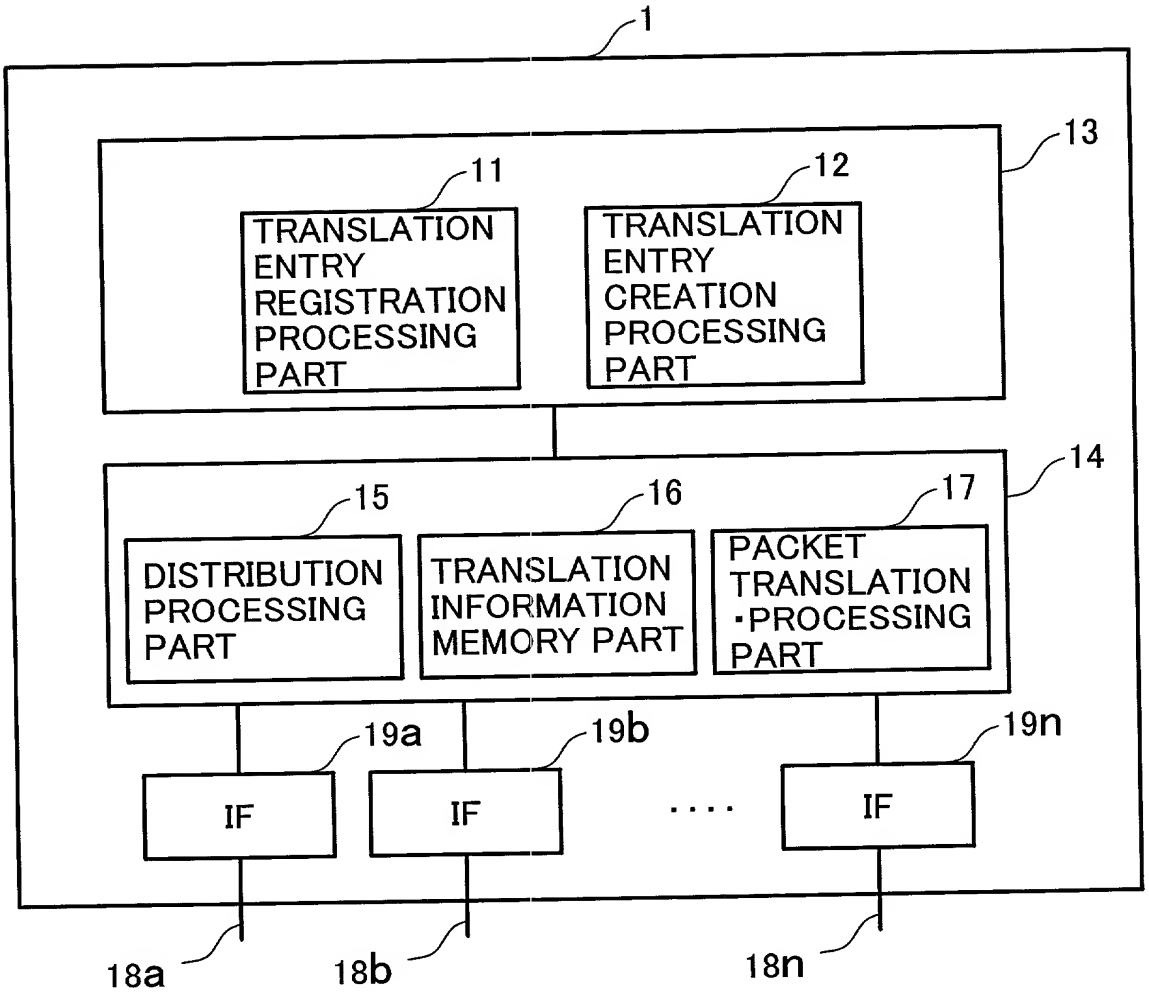
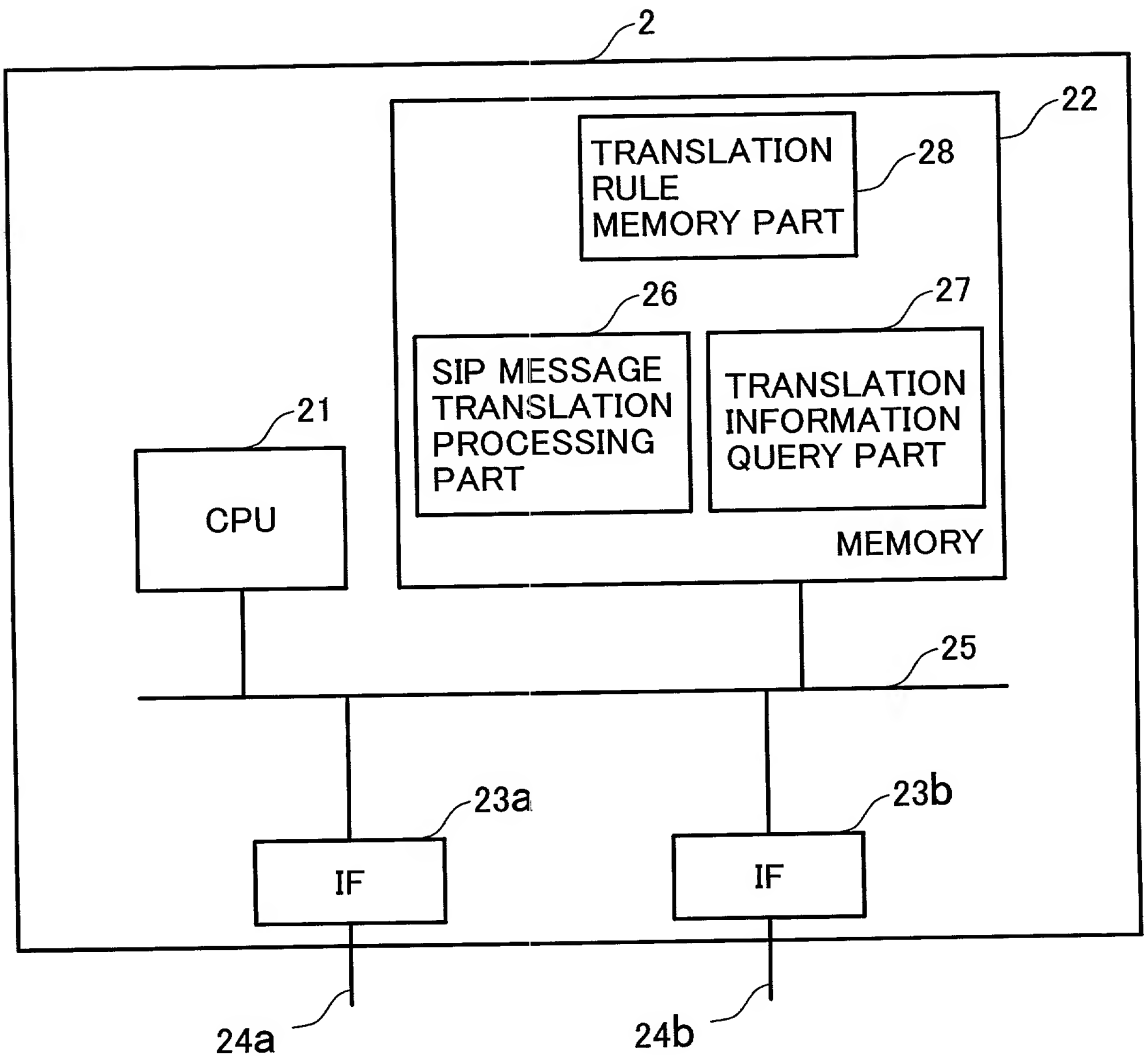
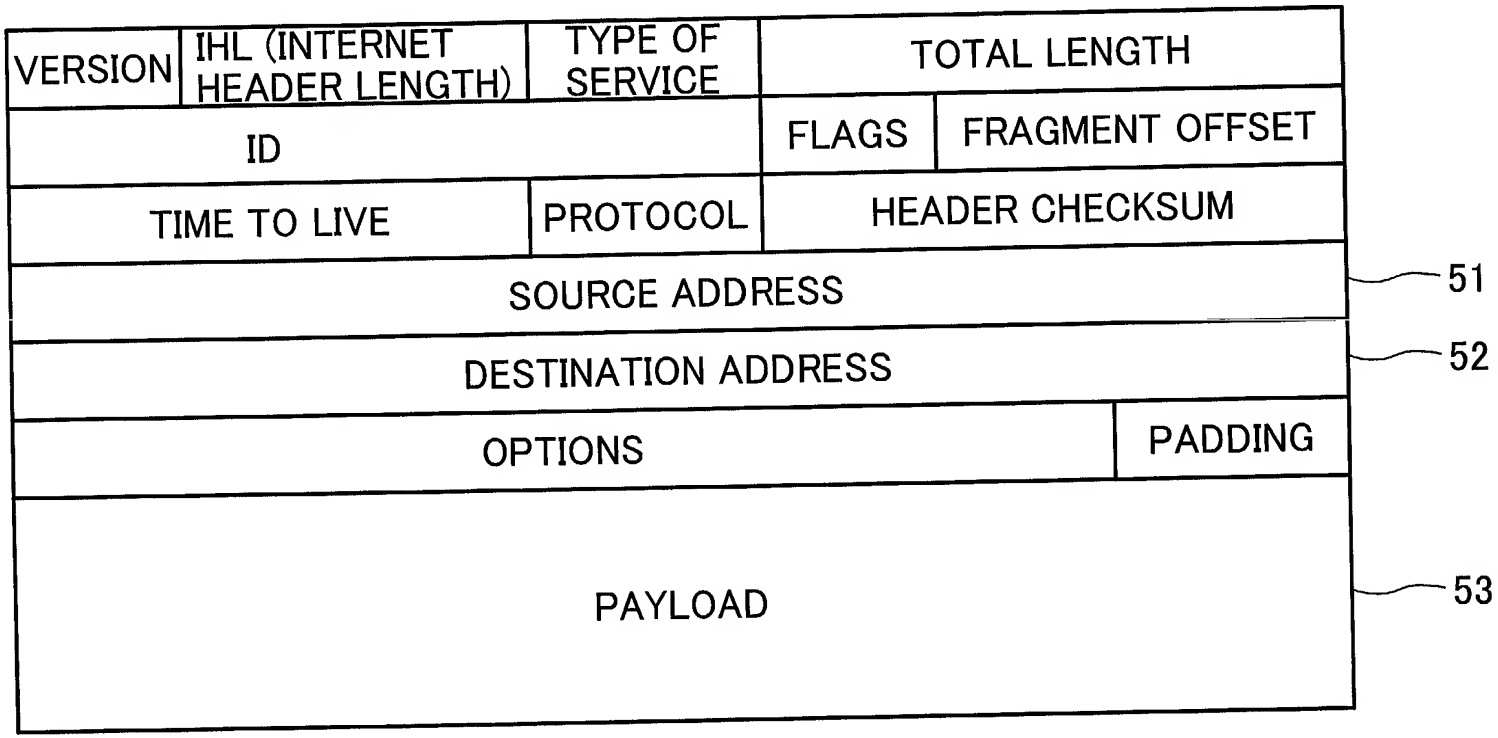

1
13
11
12
TRANSLATION ENTRY REGISTRATION PROCESSING PART
TRANSLATION ENTRY CREATION PROCESSING PART
14
15
16
17
DISTRIBUTION PROCESSING PART
TRANSLATION INFORMATION MEMORY PART
PACKET TRANSLATION ·PROCESSING PART
19a
19b
19n
IF
IF
IF
18a
18b
18n

FIG.3


2
22
TRANSLATION RULE MEMORY PART
28
26
27
SIP MESSAGE TRANSLATION PROCESSING PART
TRANSLATION INFORMATION QUERY PART
MEMORY
21
CPU
25
23a
23b
IF
IF
24a
24b

3054200 20070001

FIG.4



2052230 "SEST8001"

FIG.5

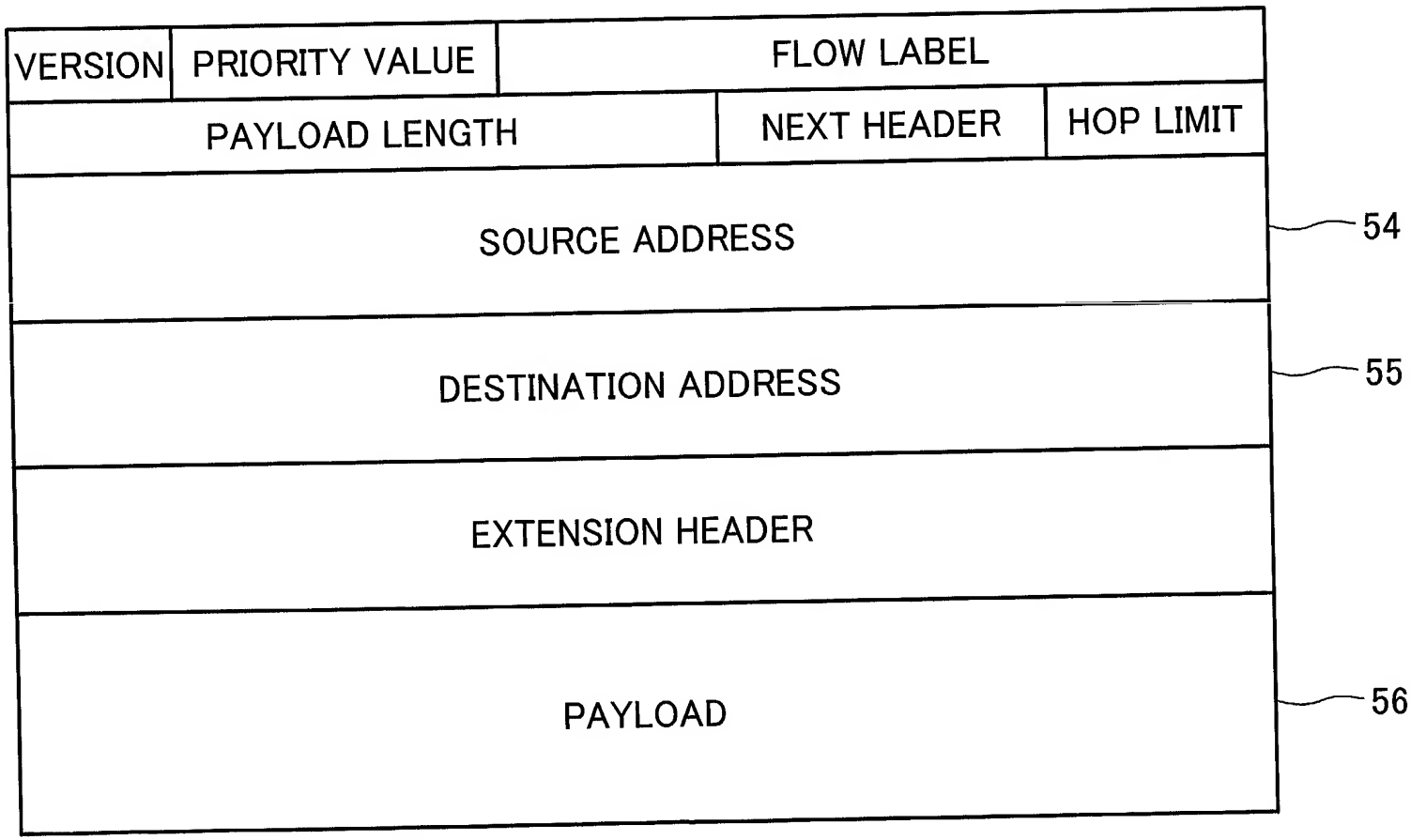


FIG.6

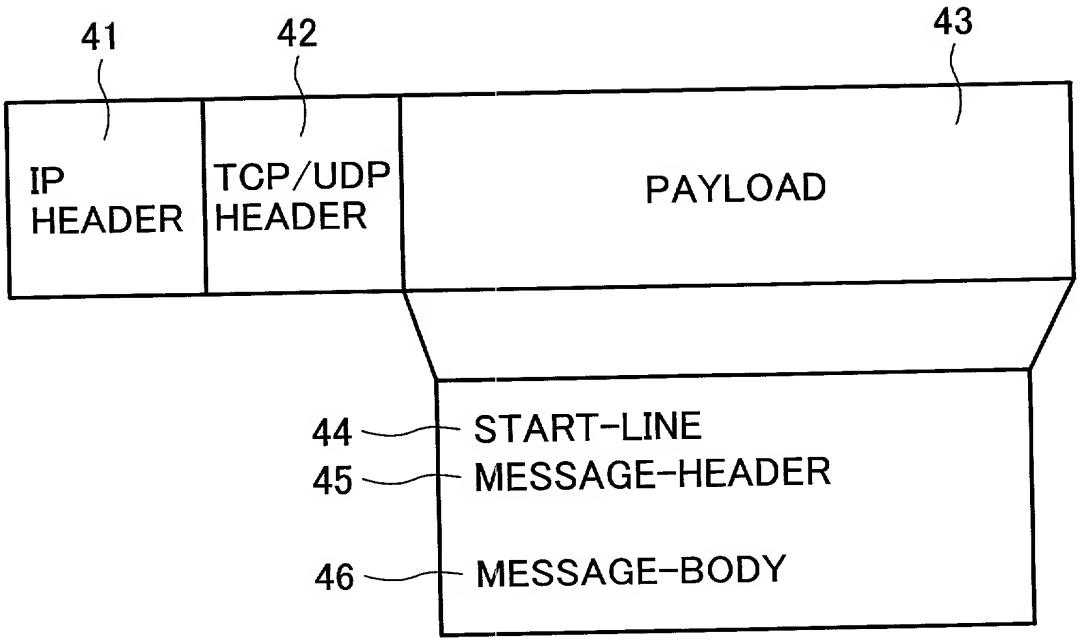

41
42
43
IP HEADER
TCP/UDP HEADER
PAYLOAD
44
START-LINE
45
MESSAGE-HEADER
46
MESSAGE-BODY

FIG.7

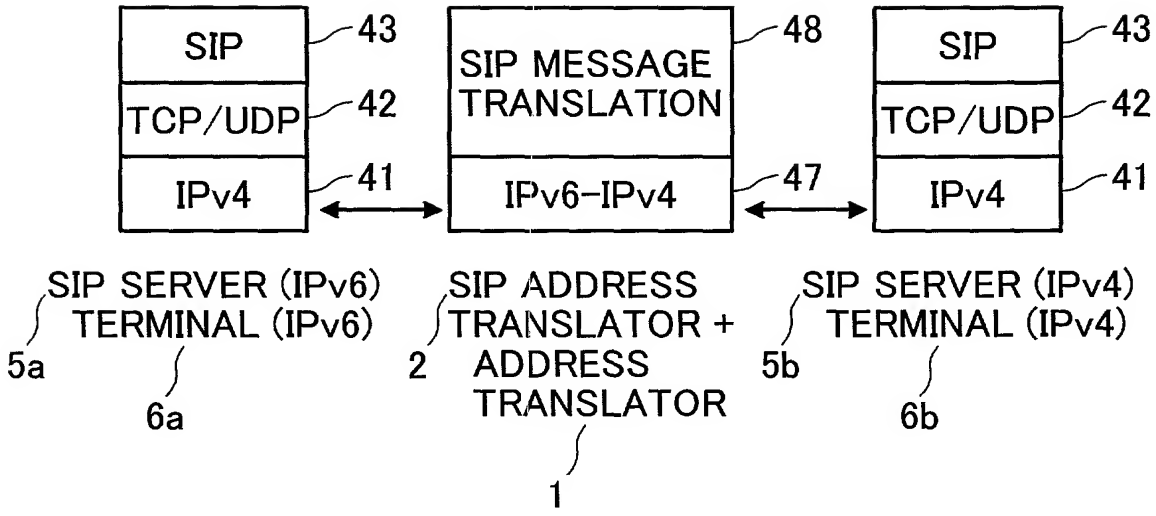

SIP
TCP/UDP
IPv4
43
42
41
SIP MESSAGE TRANSLATION
IPv6-IPv4
48
47
SIP
TCP/UDP
IPv4
43
42
41
SIP SERVER (IPv6) TERMINAL (IPv6)
5a
6a
SIP ADDRESS TRANSLATOR + ADDRESS TRANSLATOR
2
1
SIP SERVER (IPv4) TERMINAL (IPv4)
5b
6b

FIG.8

401 SIP INVITE MESSAGE EXAMPLE 1
(TERMINAL 6a → SIP SERVER 5a)

START-LINE
- INVITE sip: userB@biloxi.com SIP/2.0

MESSAGE-HEADER
- Via: SIP/2.0/UDP a6
- To: Bob <sip:userB@biloxi.com>
- From: Alice <sip:userA@atlanta.com>;tag=123
- Call-ID: 12345@ a6
- CSeq: 1 INVITE
- Contact: <sip:userA@ a6>
- Content-Type: application/sdp

MESSAGE-BODY
- v=0
- o=UserB 123 456 IN IP4 userA.atlanta.com
- c=IN IP6 a6
- m=audio 45678

FIG.9

402 SIP INVITE MESSAGE EXAMPLE 2
(SIP SERVER 5a → ADDRESS TRANSLATOR 1)

START-LINE
- INVITE sip: userB@biloxi.com SIP/2.0

MESSAGE-HEADER
- Via: SIP/2.0/UDP sipa6
  SIP/2.0/UDP a6
- To: Bob <sip:userB@biloxi.com>
- From: Alice <sip:userA@atlanta.com>;tag=123
- Call-ID: 12345@ a6
- CSeq: 1 INVITE
- Contact: <sip:userA@ a6>
- Content-Type: application/sdp

MESSAGE-BODY
- v=0
- o=UserB 123 456 IN IP4 userA.atlanta.com
- c=IN IP6 a6
- m=audio 45678

FIG.10

403 SIP INVITE MESSAGE EXAMPLE 3
(ADDRESS TRANSLATOR 1 → SIP SERVER 5b)

START-LINE	INVITE sip: userB@biloxi.com SIP/2.0
MESSAGE-HEADER	Via: SIP/2.0/UDP sipa4 SIP/2.0/UDP va4 To: Bob <sip:userB@biloxi.com> From: Alice <sip:userA@atlanta.com>;tag=123 Call-ID: 12345@ va4 CSeq: 1 INVITE Contact: <sip:userA@ va4> Content-Type: application/sdp
MESSAGE-BODY	v=0 o=UserB 123 456 IN IP4 userA.atlanta.com c=IN IP4 va4 m=audio 45678

EP 2 355 464 A1

FIG.11

404 SIP INVITE MESSAGE EXAMPLE 4
(SIP SERVER 5b → TERMINAL 6b)

START-LINE	INVITE sip: userB@biloxi.com SIP/2.0
MESSAGE-HEADER	Via: SIP/2.0/UDP sipb4 SIP/2.0/UDP vsipa4 SIP/2.0/UDP va4 To: Bob <sip:userB@biloxi.com> From: Alice <sip:userA@atlanta.com>;tag=123 Call-ID: 12345@ va4 CSeq: 1 INVITE Contact: <sip:userA@ va4> Content-Type: application/sdp
MESSAGE-BODY	v=0 o=UserB 123 456 IN IP4 userA.atlanta.com c=IN IP4 va4 m=audio 45678

FIG.12

405 SIP 200 OK MESSAGE EXAMPLE 1
(TERMINAL 6b → SIP SERVER 5b)

START-LINE	SIP/2.0 200 OK
MESSAGE-HEADER	Via: SIP/2.0/UDP sipb4 SIP/2.0/UDP vsipa4 SIP/2.0/UDP va4 To: Bob <sip:userB@biloxi.com> ;tag=111 From: Alice <sip:userA@atlanta.com>;tag=123 Call-ID: 12345@ va4 CSeq: 1 INVITE Contact: <sip:userB@ b4> Content-Type: application/sdp
MESSAGE-BODY	v=0 o=UserB 123 456 IN IP4 userB.biloxi.com c=IN IP4 b4 m=audio 35678

2055249.55249007

FIG.13

406 SIP 200 OK MESSAGE EXAMPLE 2
(SIP SERVER 5b → ADDRESS TRANSLATOR 1)

START-LINE	SIP/2.0 200 OK
MESSAGE-HEADER	Via: SIP/2.0/UDP vsipa4 SIP/2.0/UDP va4 To: Bob <sip:userB@biloxi.com> ;tag=111 From: Alice <sip:userA@atlanta.com>;tag=123 Call-ID: 12345@ va4 CSeq: 1 INVITE Contact: <sip:userB@ b4> Content-Type: application/sdp
MESSAGE-BODY	v=0 o=UserB 123 456 IN IP4 userB.biloxi.com c=IN IP4 b4 m=audio 35678

FIG.14

407 SIP 200 OK MESSAGE EXAMPLE 3
(ADDRESS TRANSLATOR 1 → SIP SERVER 5a)

START-LINE	SIP/2.0 200 OK
MESSAGE-HEADER	Via: SIP/2.0/UDP sipa6 SIP/2.0/UDP a6 To: Bob <sip:userB@biloxi.com> ;tag=111 From: Alice <sip:userA@atlanta.com>;tag=123 Call-ID: 12345@ a6 CSeq: 1 INVITE Contact: <sip:userB@ vb6> Content-Type: application/sdp
MESSAGE-BODY	v=0 o=UserB 123 456 IN IP4 userB.biloxi.com c=IN IP6 vb6 m=audio 35678

US 2005/0254514 A1 Nov. 17, 2005

FIG.15

408 SIP INVITE MESSAGE EXAMPLE 4
(SIP SERVER 5a → TERMINAL 6a)

START-LINE	SIP/2.0 200 OK
MESSAGE-HEADER	Via: SIP/2.0/UDP a6 To: Bob <sip:userB@biloxi.com> ;tag=111 From: Alice <sip:userA@atlanta.com>;tag=123 Call-ID: 12345@ a6 CSeq: 1 INVITE Contact: <sip:userB@ vb6> Content-Type: application/sdp
MESSAGE-BODY	v=0 o=UserB 123 456 IN IP4 userB.biloxi.com c=IN IP6 vb6 m=audio 35678

FIG.16

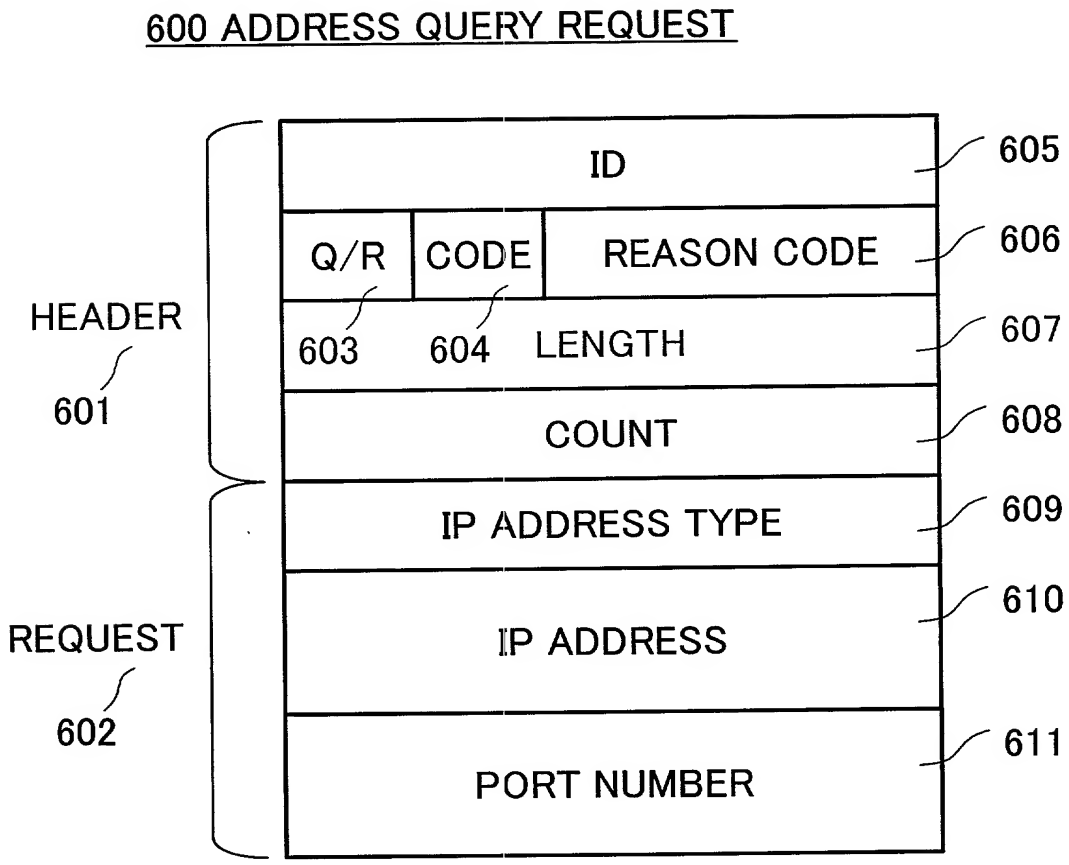

600 ADDRESS QUERY REQUEST
ID
605
Q/R
CODE
REASON CODE
606
HEADER
603
604
LENGTH
607
601
COUNT
608
IP ADDRESS TYPE
609
610
REQUEST
IP ADDRESS
602
611
PORT NUMBER

FIG.17

650 ADDRESS QUERY REQUEST RESPONSE

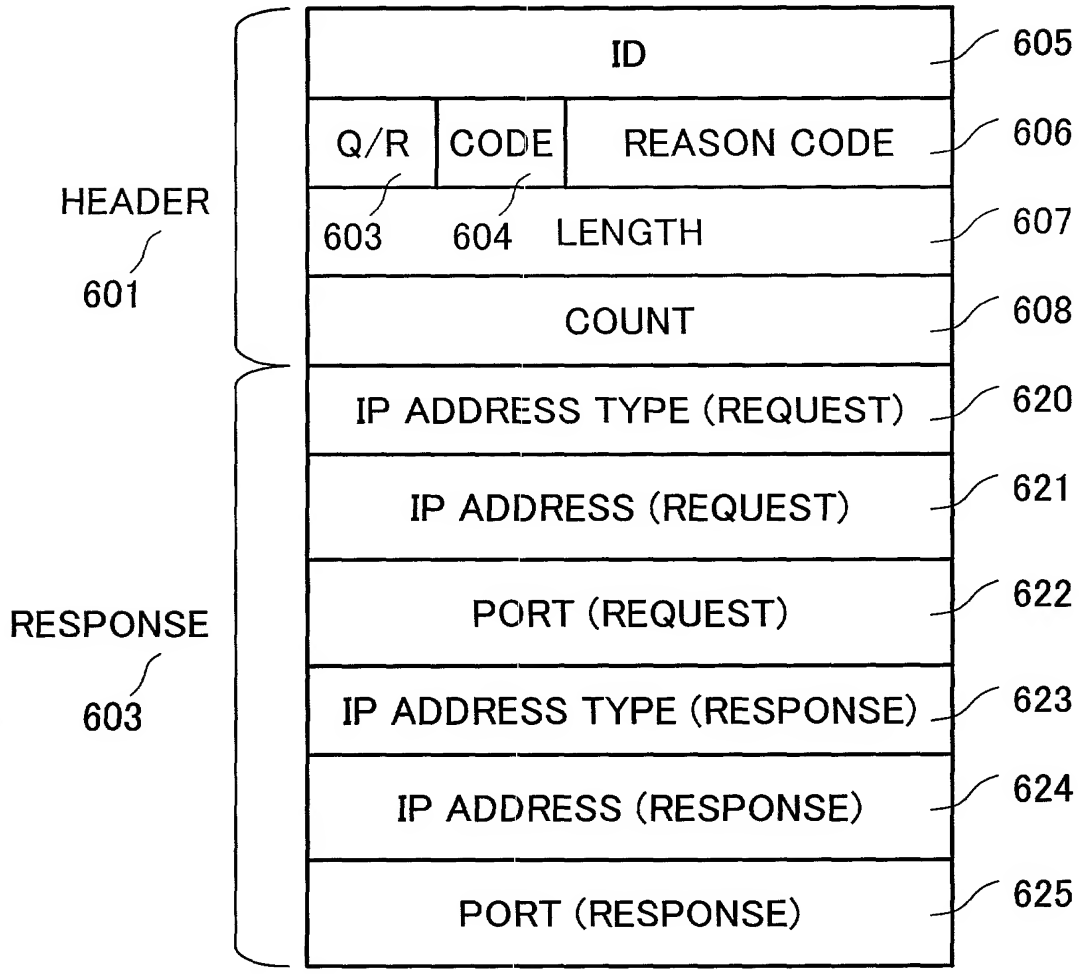


FIG.18

60 SIP MESSAGE TRANSLATION PROCESSING ROUTINE 1

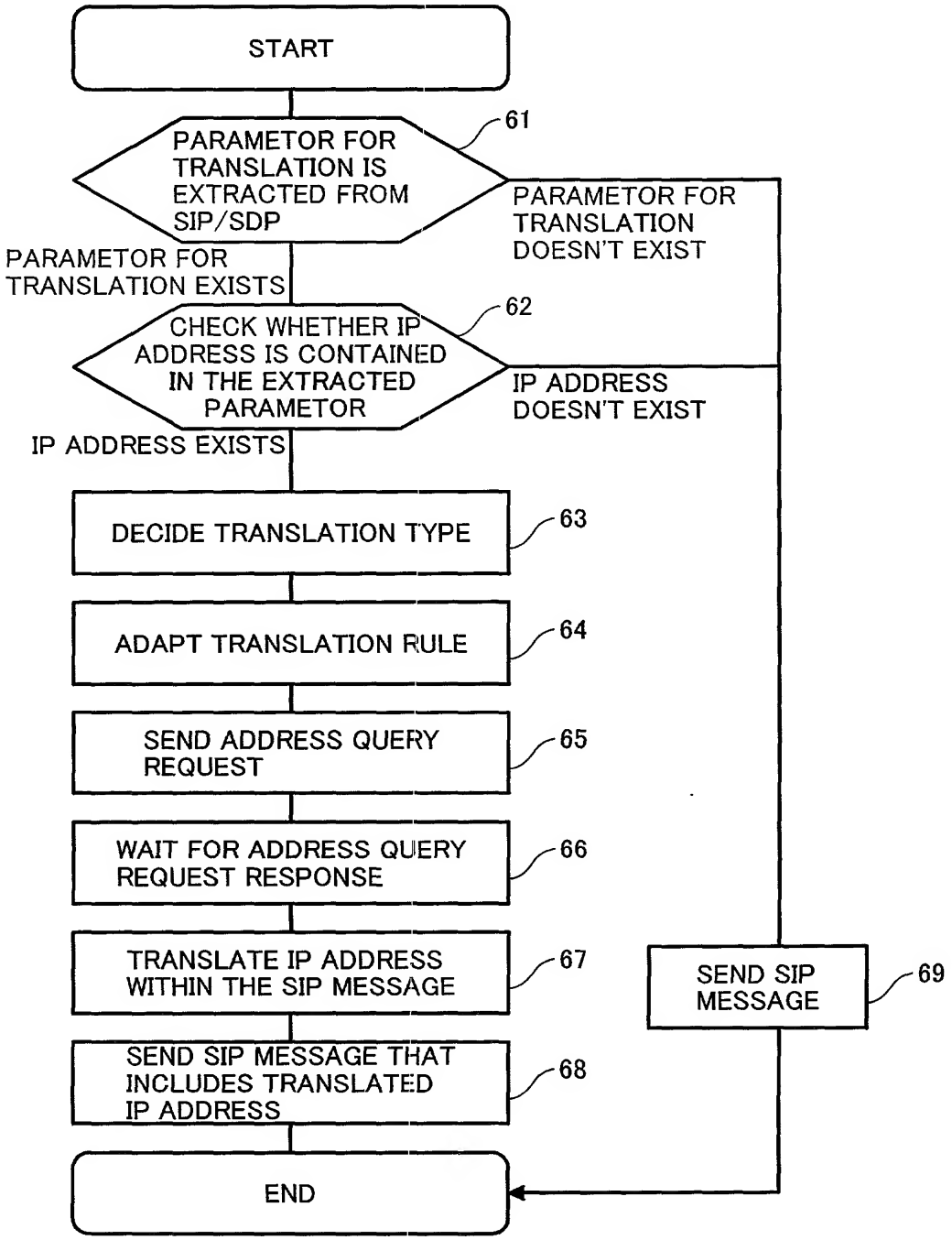


FIG.19

500 TRANSLATION INFORMATION TABLE

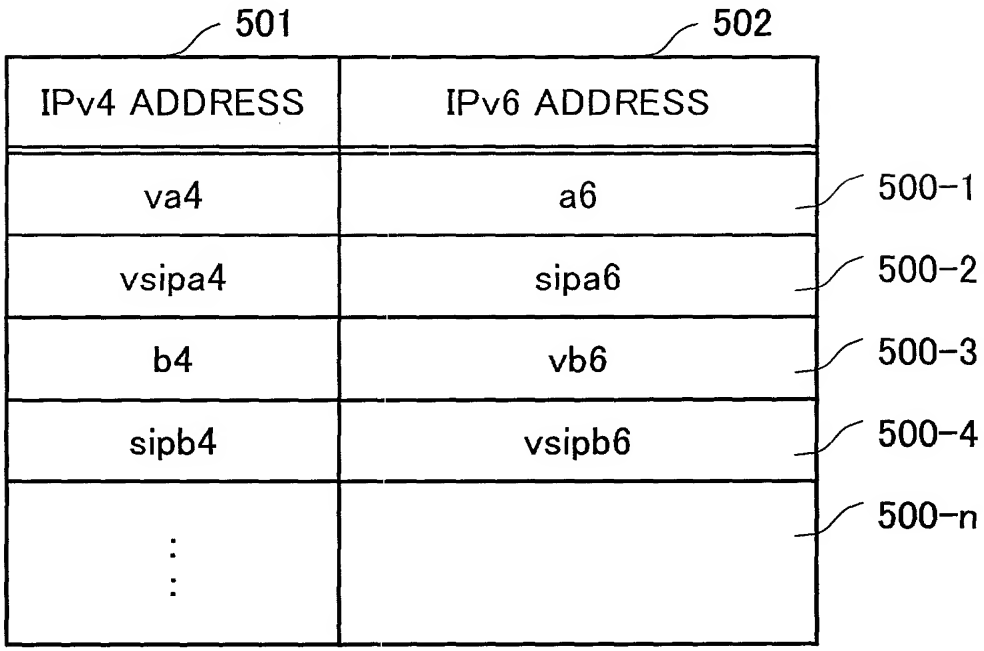


FIG.20

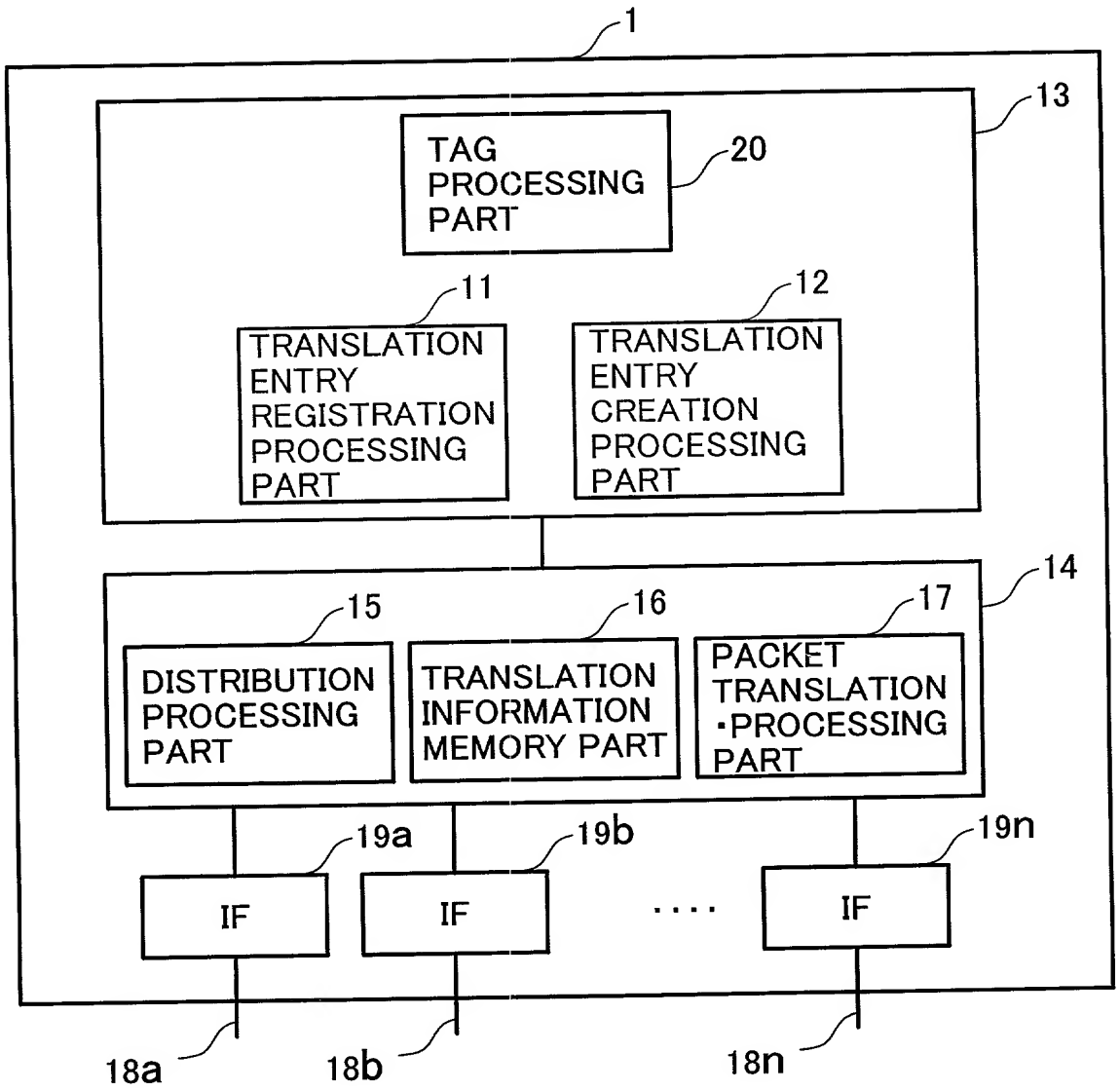

1
13
TAG PROCESSING PART
20
11
TRANSLATION ENTRY REGISTRATION PROCESSING PART
12
TRANSLATION ENTRY CREATION PROCESSING PART
14
15
DISTRIBUTION PROCESSING PART
16
TRANSLATION INFORMATION MEMORY PART
17
PACKET TRANSLATION ·PROCESSING PART
19a
19b
19n
IF
IF
IF
18a
18b
18n

FIG.21

410 EXAMPLE OF SIP MESSAGE WITH TAG

START-LINE: nat123-INVITE sip:userB@biloxi.com SIP/2.0

MESSAGE-HEADER:
nat123-Via: SIP/2.0/UDP sipa6
SIP/2.0/UDP a6
nat123-To: Bob <sip:userB@biloxi.com>
nat123-From: Alice <sip:userA@atlanta.com>;tag=123
nat123-Call-ID: 12345@ a6
CSeq: 1 INVITE
nat123-Contact: <sip:userA@ a6>
Content-Type: application/sdp

MESSAGE-BODY:
v=0
nat123-o=UserB 123 456 IN IP4 userA.atlanta.com
nat123-c=IN IP6 a6
m=audio 45678

2005-12-15 15:51:20.01

FIG.22

80 TAG ADDITION PROCESSING ROUTINE IN ADDRESS TRANSLATOR

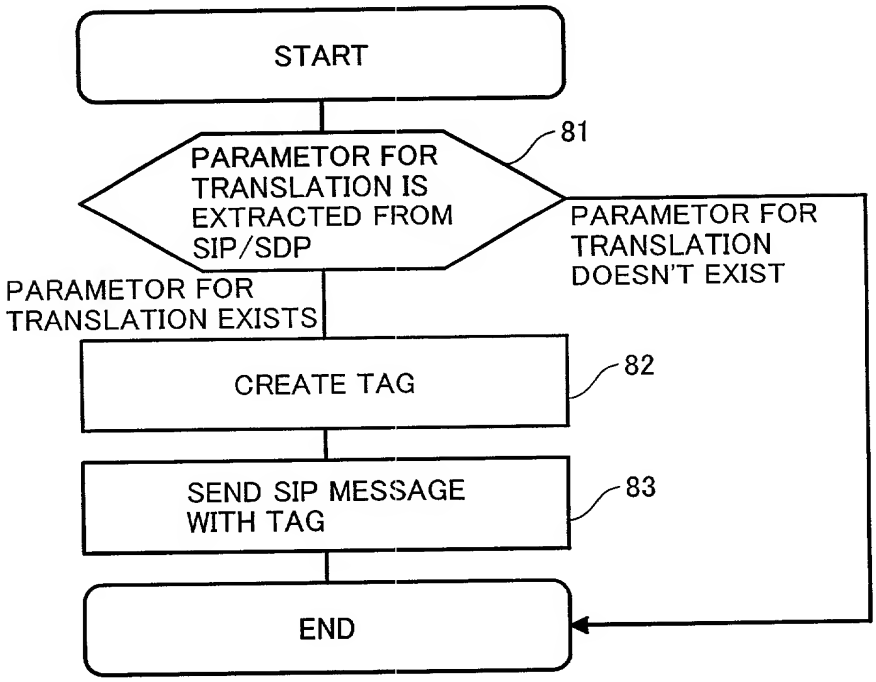


FIG.23

70 SIP MESSAGE TRANSLATION PROCESSING ROUTINE 2

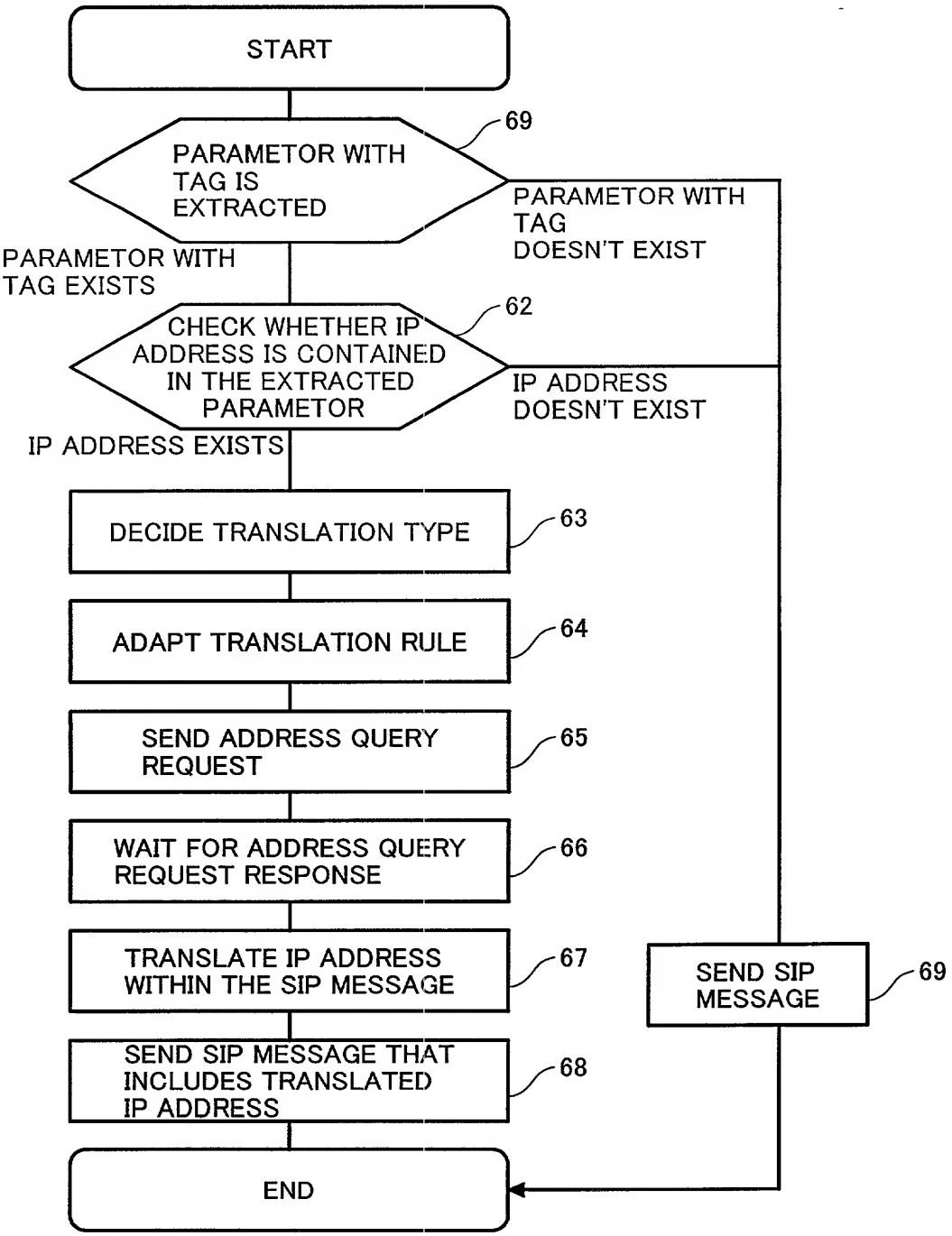


FIG.24

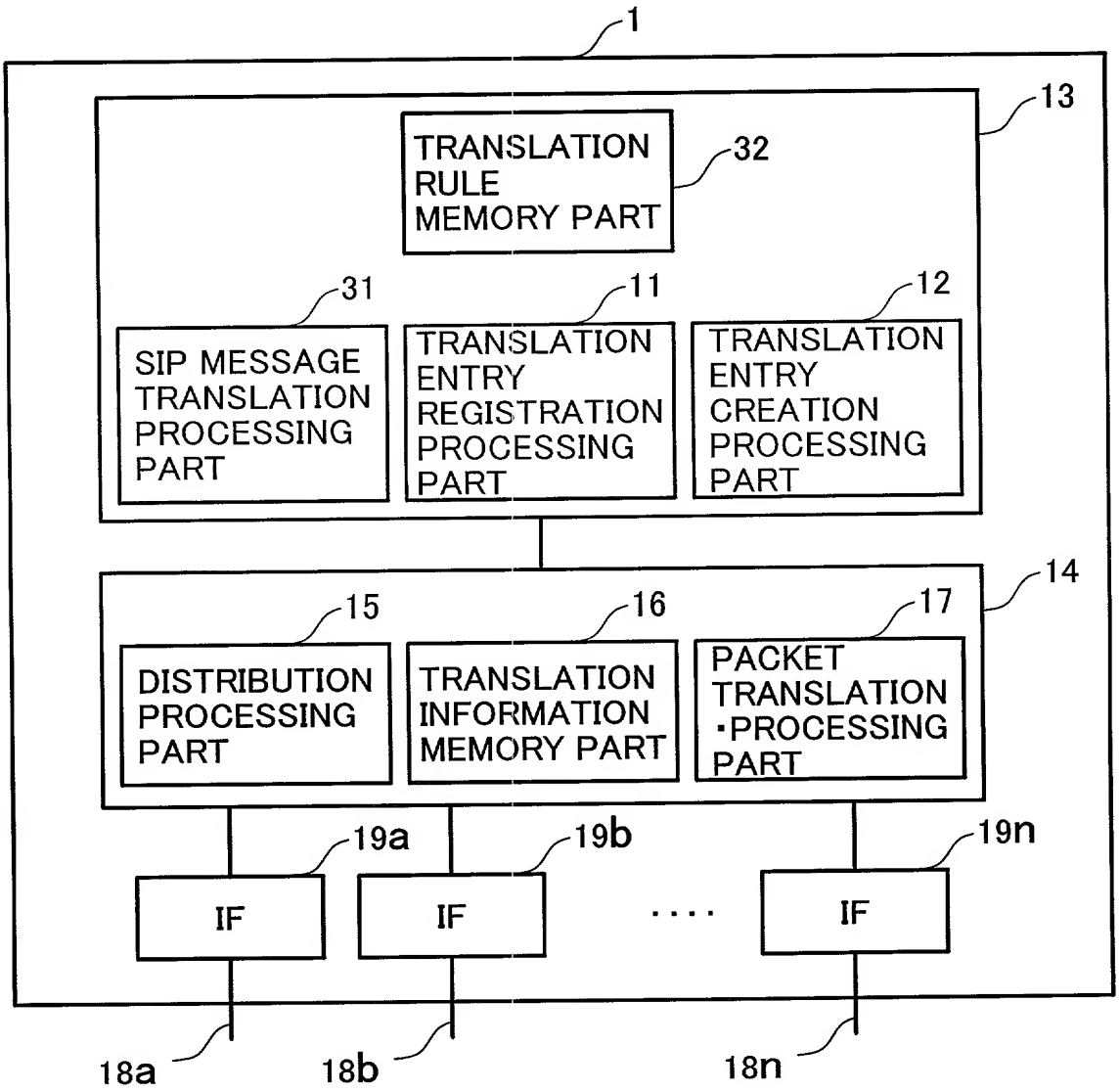

1
13
TRANSLATION RULE MEMORY PART
32
31
11
12
SIP MESSAGE TRANSLATION PROCESSING PART
TRANSLATION ENTRY REGISTRATION PROCESSING PART
TRANSLATION ENTRY CREATION PROCESSING PART
14
15
16
17
DISTRIBUTION PROCESSING PART
TRANSLATION INFORMATION MEMORY PART
PACKET TRANSLATION ·PROCESSING PART
19a
19b
19n
IF
IF
IF
18a
18b
18n

FIG.25

412 PARAMETOR LIST FOR TRANSLATION

START-LINE	REQUEST-URI
MESSAGE HEADER	VIA
	CONTACT
	RECORD-ROUTE
	ROUTE
	TO
	FROM
	CALL-ID
MESSAGE BODY	c=
	o=
	m=

FIG.26

413 NAT-PT TRANSLATION RULE

FIELD FOR TRANSLATION		ACTION
START-LINE	REQUEST-URI	ADDRESS TRANSLATION
MESSAGE -HEADER	VIA CONTACT RECORD-ROUTE ROUTE TO FROM CALL-ID	ADDRESS TRANSLATION
MESSAGE BODY	o c	ADDRESS TRANSLATION
	m	NO TRANSLATION

FIG.27

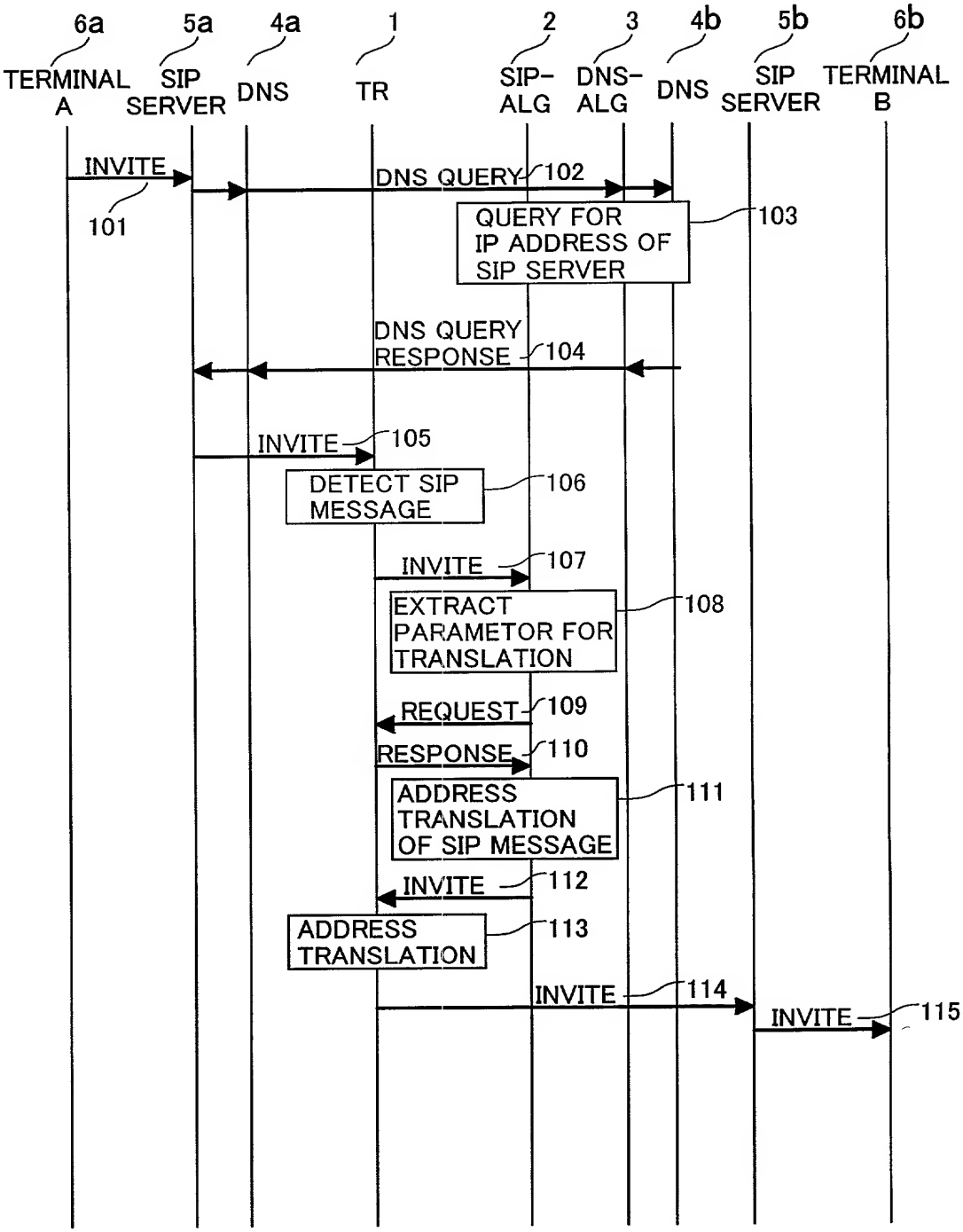

6a
5a
4a
1
2
3
4b
5b
6b
TERMINAL A
SIP SERVER
DNS
TR
SIP-ALG
DNS-ALG
DNS
SIP SERVER
TERMINAL B
INVITE
101
DNS QUERY
102
QUERY FOR IP ADDRESS OF SIP SERVER
103
DNS QUERY RESPONSE
104
INVITE
105
DETECT SIP MESSAGE
106
INVITE
107
EXTRACT PARAMETOR FOR TRANSLATION
108
REQUEST
109
RESPONSE
110
ADDRESS TRANSLATION OF SIP MESSAGE
111
INVITE
112
ADDRESS TRANSLATION
113
INVITE
114
INVITE
115

FIG.28

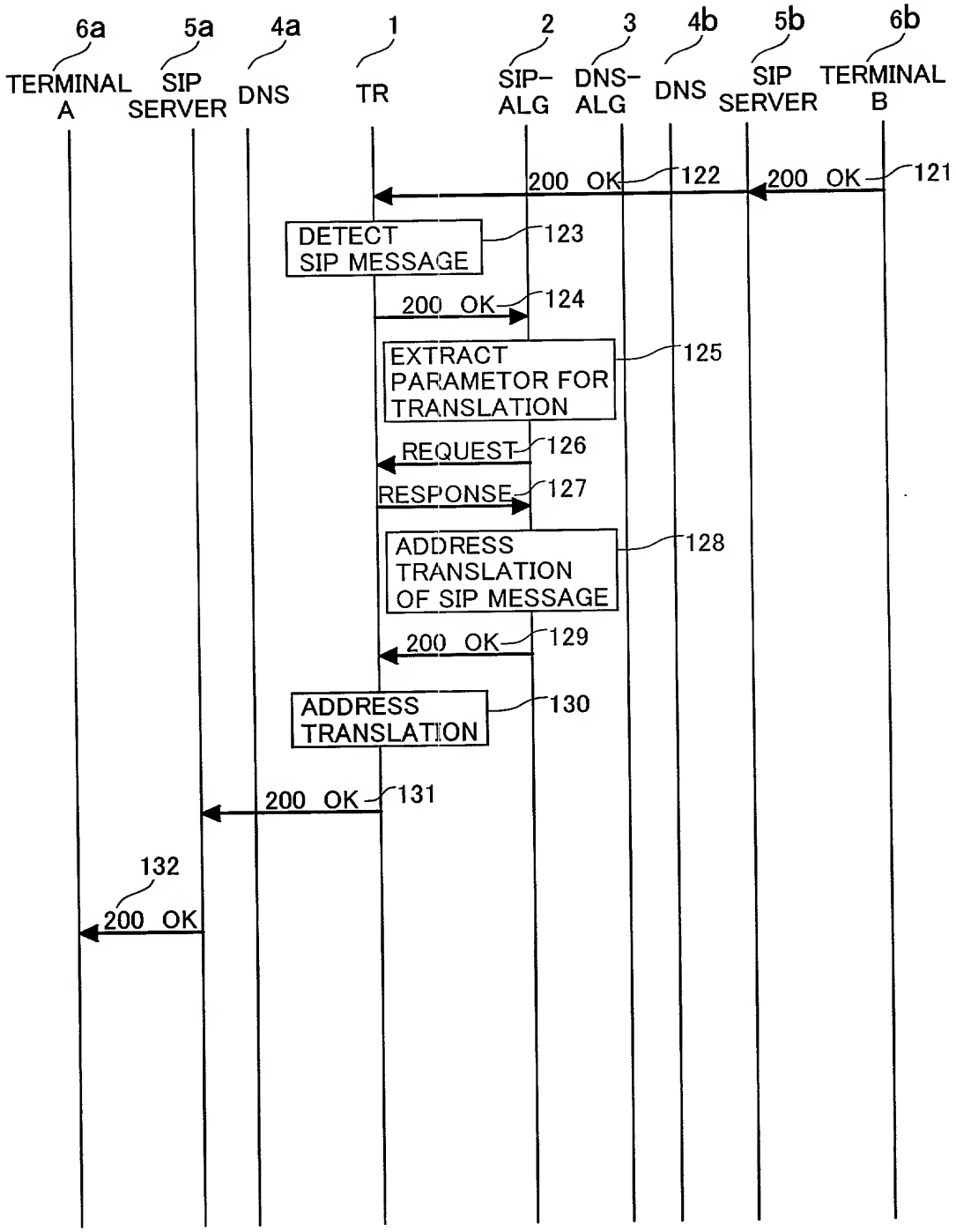

6a
TERMINAL A
5a
SIP SERVER
4a
DNS
1
TR
2
SIP-ALG
3
DNS-ALG
4b
DNS
5b
SIP SERVER
6b
TERMINAL B
200 OK
122
200 OK
121
DETECT SIP MESSAGE
123
200 OK
124
EXTRACT PARAMETOR FOR TRANSLATION
125
REQUEST
126
RESPONSE
127
ADDRESS TRANSLATION OF SIP MESSAGE
128
200 OK
129
ADDRESS TRANSLATION
130
200 OK
131
132
200 OK

FIG.29

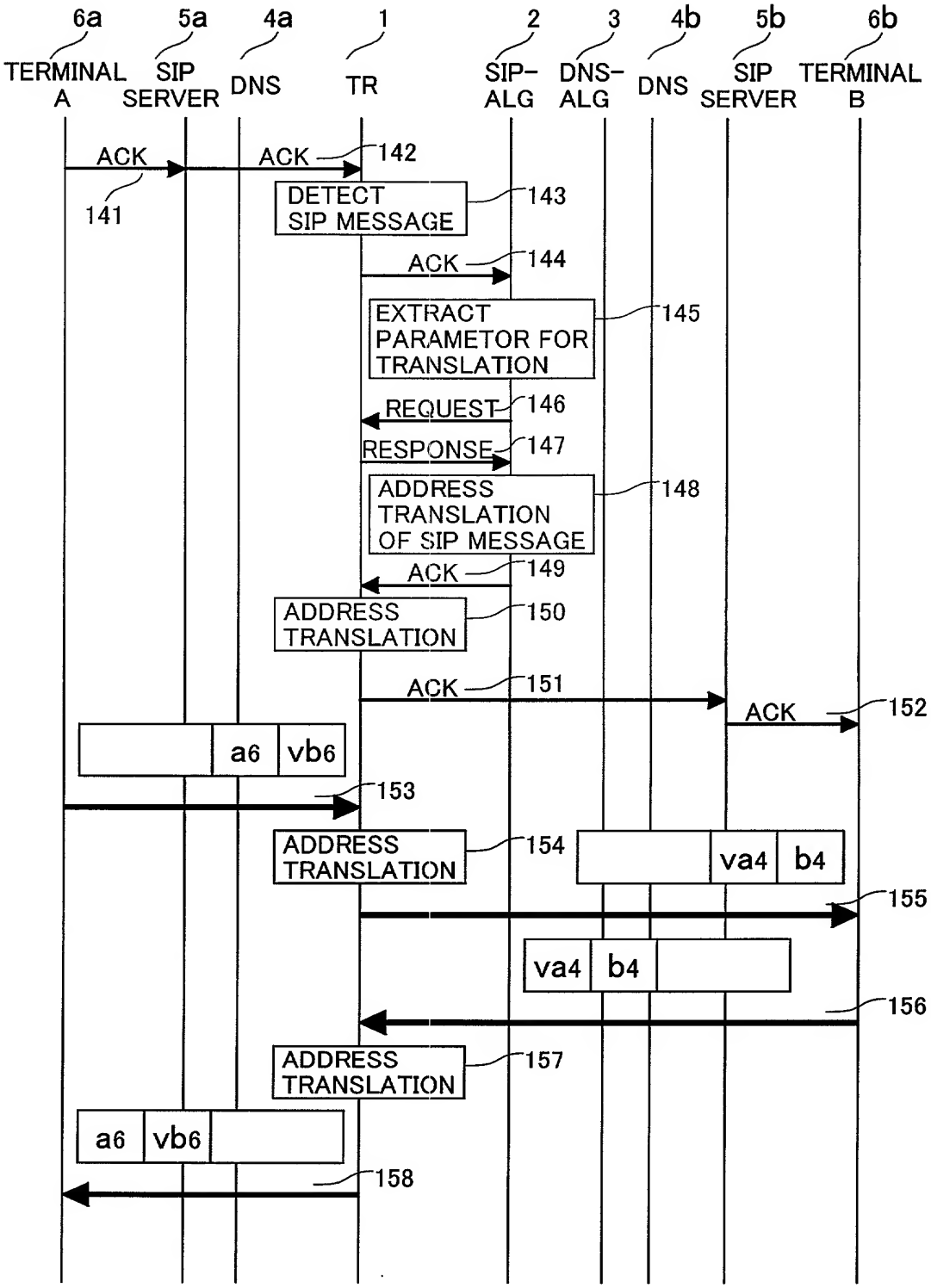

6a
5a
4a
1
2
3
4b
5b
6b
TERMINAL A
SIP SERVER
DNS
TR
SIP-ALG
DNS-ALG
DNS
SIP SERVER
TERMINAL B
ACK
ACK
142
141
DETECT SIP MESSAGE
143
ACK
144
EXTRACT PARAMETOR FOR TRANSLATION
145
REQUEST
146
RESPONSE
147
ADDRESS TRANSLATION OF SIP MESSAGE
148
ACK
149
ADDRESS TRANSLATION
150
ACK
151
ACK
152
a6
vb6
153
ADDRESS TRANSLATION
154
va4
b4
155
va4
b4
156
ADDRESS TRANSLATION
157
a6
vb6
158

FIG.30

90 TAG ADDITION PROCESSING ROUTINE IN ADDRESS TRANSLATOR 2

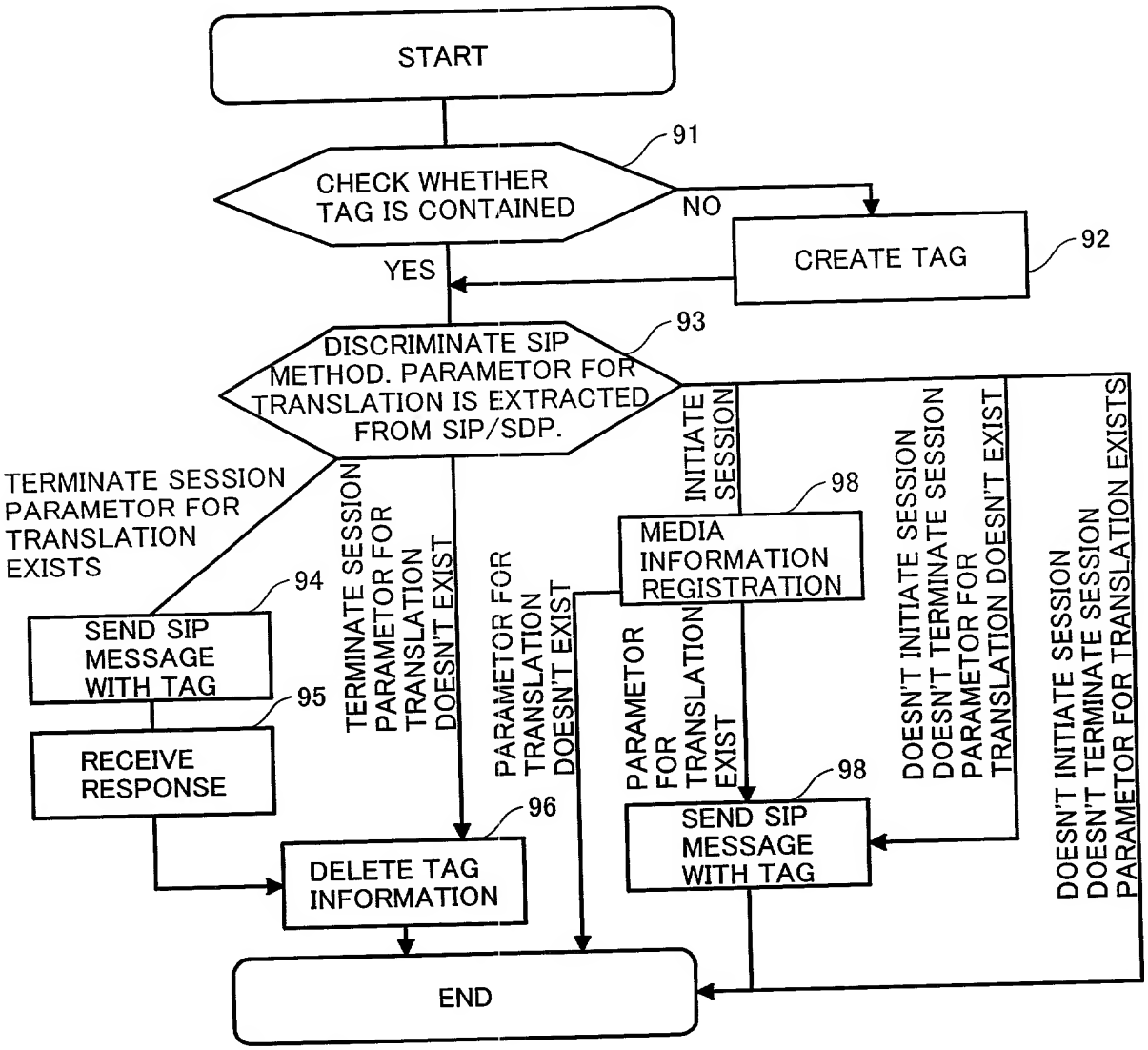


FIG.31

300 TAG MANAGEMENT TABLE

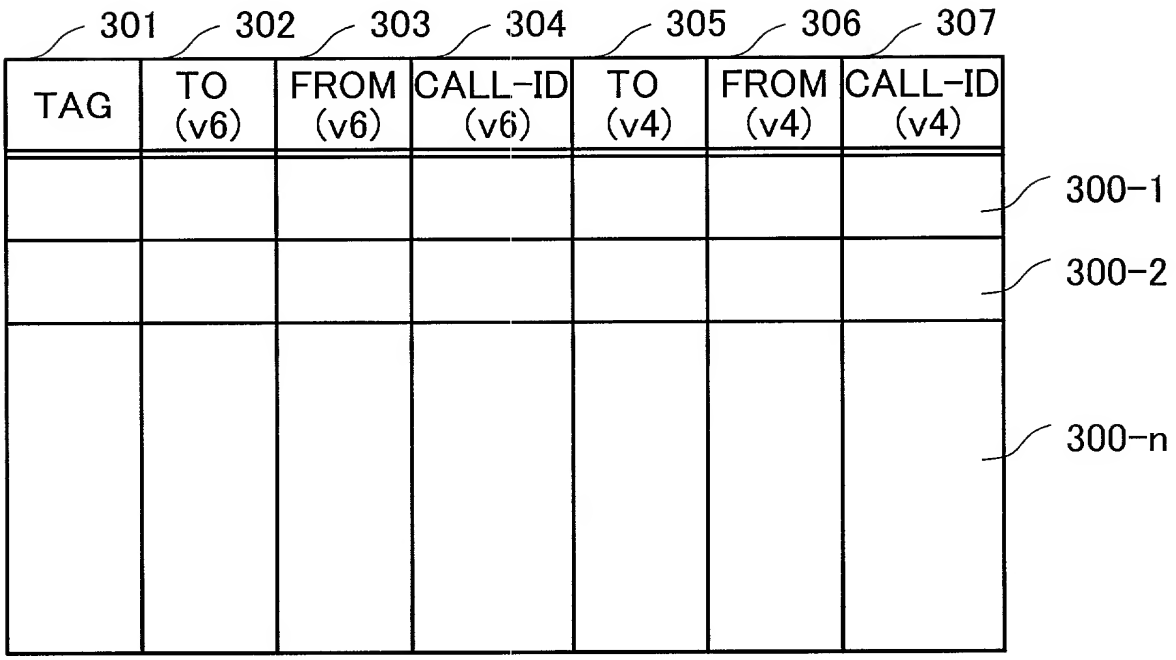


FIG.32

310 MEDIA INFORMATION MANAGEMENT TABLE

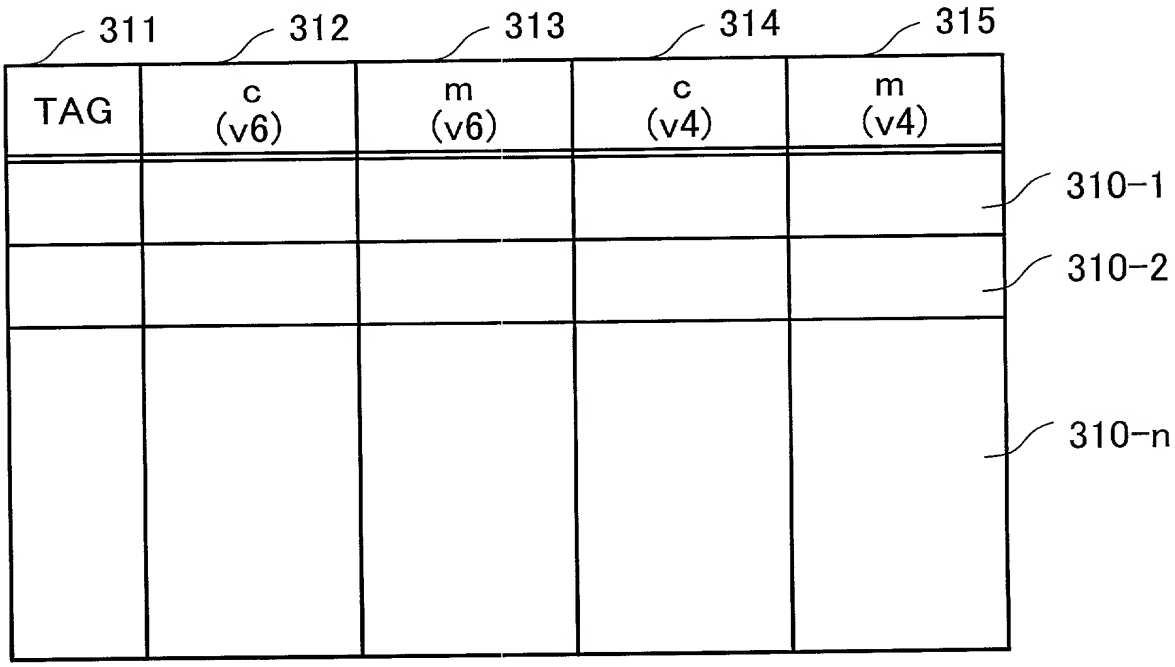


FIG.33

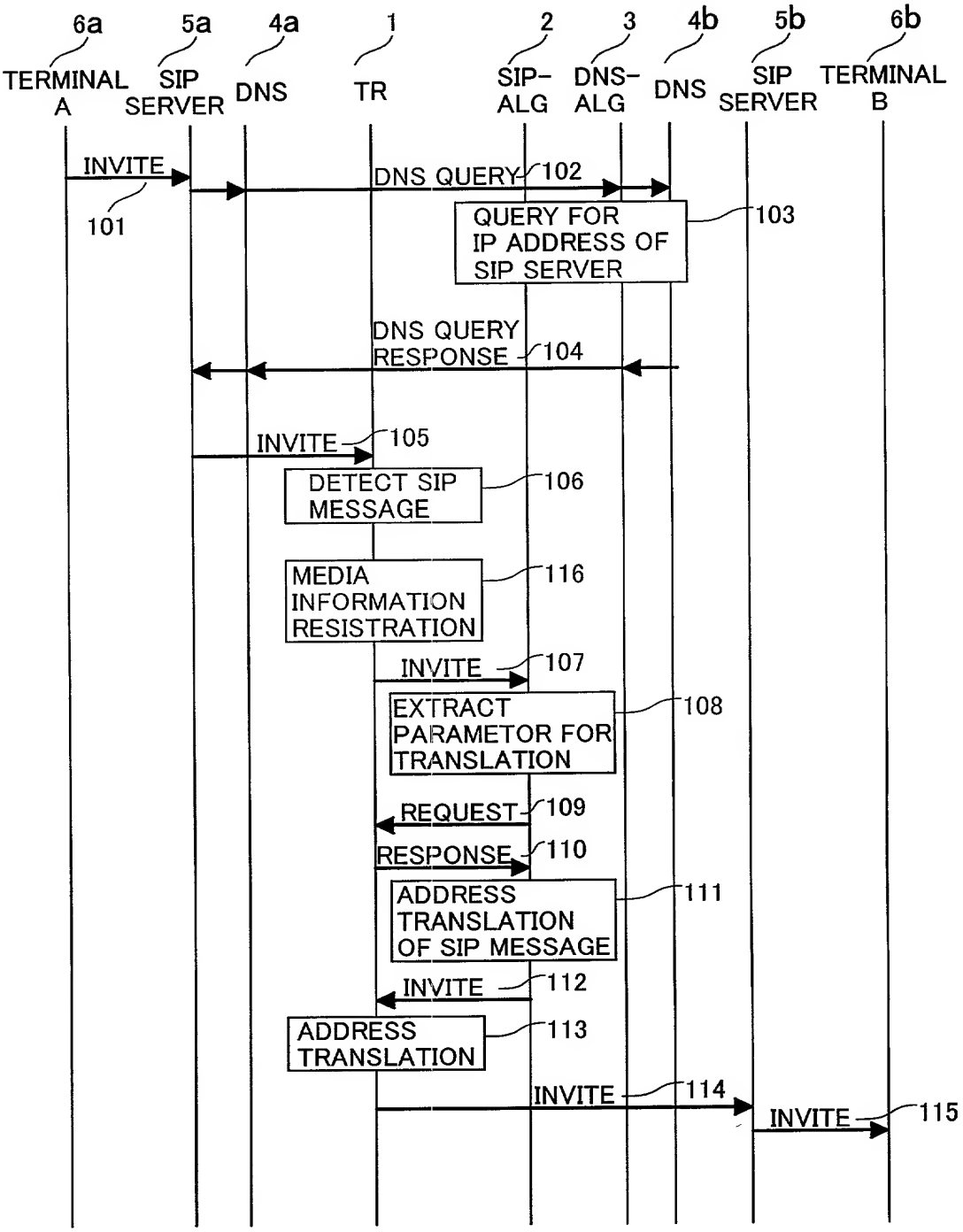

6a
TERMINAL A
5a
SIP SERVER
4a
DNS
1
TR
2
SIP-ALG
3
DNS-ALG
4b
DNS
5b
SIP SERVER
6b
TERMINAL B
INVITE
101
DNS QUERY
102
QUERY FOR IP ADDRESS OF SIP SERVER
103
DNS QUERY RESPONSE
104
INVITE
105
DETECT SIP MESSAGE
106
MEDIA INFORMATION RESISTRATION
116
INVITE
107
EXTRACT PARAMETOR FOR TRANSLATION
108
REQUEST
109
RESPONSE
110
ADDRESS TRANSLATION OF SIP MESSAGE
111
INVITE
112
ADDRESS TRANSLATION
113
INVITE
114
INVITE
115

FIG.34

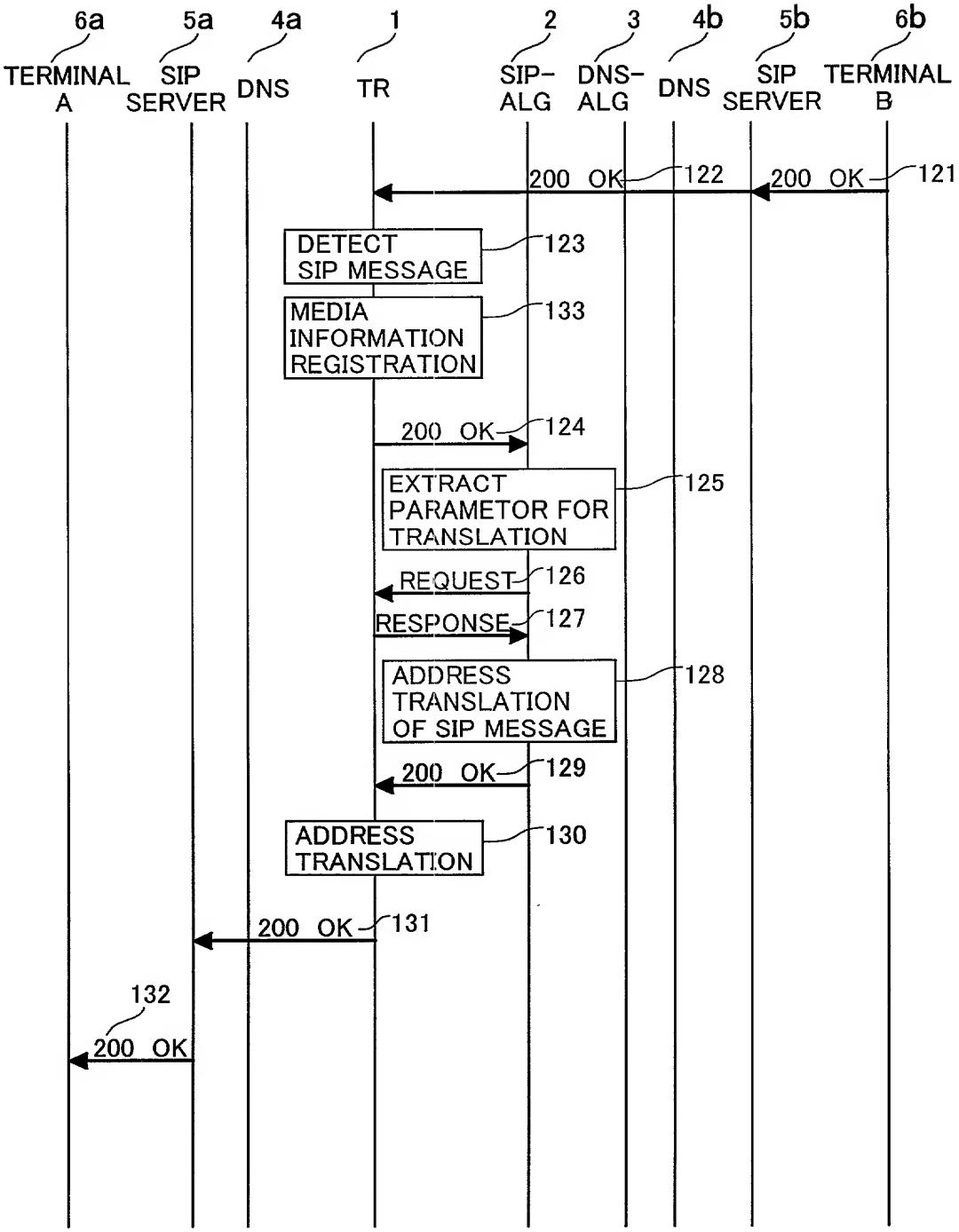
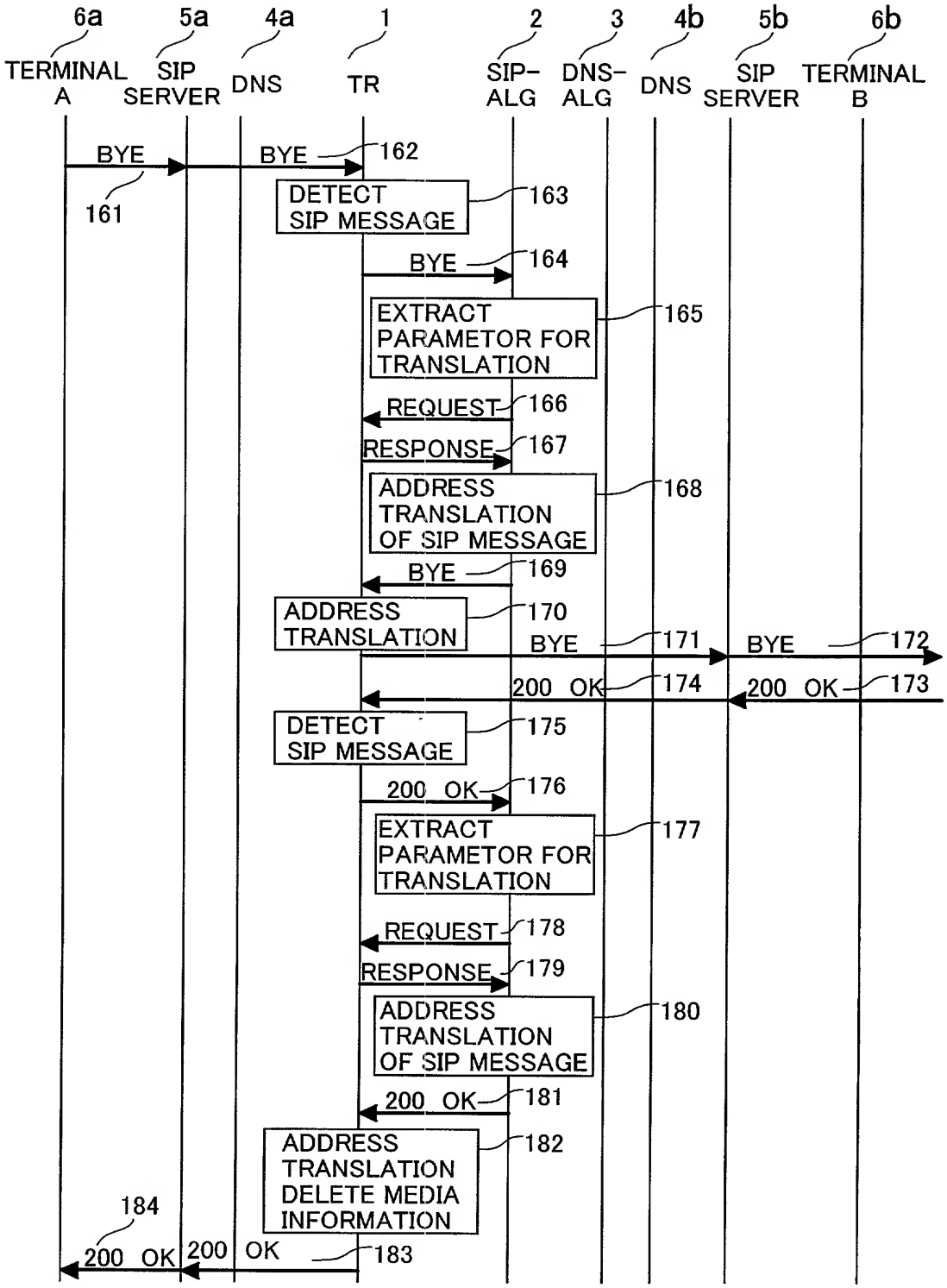

6a
TERMINAL A
5a
SIP SERVER
4a
DNS
1
TR
2
SIP-ALG
3
DNS-ALG
4b
DNS
5b
SIP SERVER
6b
TERMINAL B
200 OK
122
200 OK
121
DETECT SIP MESSAGE
123
MEDIA INFORMATION REGISTRATION
133
200 OK
124
EXTRACT PARAMETOR FOR TRANSLATION
125
REQUEST
126
RESPONSE
127
ADDRESS TRANSLATION OF SIP MESSAGE
128
200 OK
129
ADDRESS TRANSLATION
130
200 OK
131
132
200 OK

FIG.35


6a
5a
4a
1
2
3
4b
5b
6b
TERMINAL A
SIP SERVER
DNS
TR
SIP-ALG
DNS-ALG
DNS
SIP SERVER
TERMINAL B
BYE
161
BYE
162
DETECT SIP MESSAGE
163
BYE
164
EXTRACT PARAMETOR FOR TRANSLATION
165
REQUEST
166
RESPONSE
167
ADDRESS TRANSLATION OF SIP MESSAGE
168
BYE
169
ADDRESS TRANSLATION
170
BYE
171
BYE
172
200 OK
174
200 OK
173
DETECT SIP MESSAGE
175
200 OK
176
EXTRACT PARAMETOR FOR TRANSLATION
177
REQUEST
178
RESPONSE
179
ADDRESS TRANSLATION OF SIP MESSAGE
180
200 OK
181
ADDRESS TRANSLATION DELETE MEDIA INFORMATION
182
184
200 OK
200 OK
183